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THE PREDICTION OF GRADES IN COLLEGE ALGEBRA--A CONTINUATION AND EXTENSION.

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HIGH SCHOOL ALGEBRA GRADES OF 157 STUDENTS WERE BETTER PREDICTORS OF THEIR PERFORMANCE IN COLLEGE ALGEBRA (MATH 101) THAN EITHER THEIR SCHOLASTIC APTITUDE TEST-MATHEMATICS PORTION OR THEIR SEQUENTIAL TESTS OF EDUCATION PROGRESS-MATHEMATICS SUBTEST SCORES. THE AVERAGE OF THE STUDENTS' ALGEBRA I AND II GRADES SHOWED A CORRELATION WITH THEIR MATH 101 GRADES OF .47 FOR MALES AND .56 FOR FEMALES. THE ALGEBRA II GRADES SHOWED A CORRELATION WITH MATH 101 GRADES OF .49 FOR MALES AND .63 FOR FEMALES. GRADE PREDICTIONS BASED ON THE DATA GATHERED INDICATE THAT IF A FRESHMAN FEMALE EARNED A D (1.0) IN ALGEBRA II, HER CHANCES OF EARNING A C (2.0) IN MATH 101 WOULD BE APPROXIMATELY ONE IN 10. AT PRESENT A STUDENT MAY ENROLL IN MATH 101 AT SOUTH GEORGIA COLLEGE IF HE HAS TAKEN 2 YEARS OF HIGH SCHOOL ALGEBRA, REGARDLESS OF HOW WELL HE PERFORMED IN HIS HIGH SCHOOL CLASSES A COUNSELOR SHOULD CONSIDER A STUDENT'S PERFORMANCE IN HIGH SCHOOL ALGEBRA BEFORE ENCOURAGING HIM TO ENROLL IN MATH 101. (AD)

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A CONTINUATION AND EXTENSION

UNIVERSITY OF CALIF.
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THE PREDICTION OF GRADES IN COLLEGE ALGEBRA: A CONTINUATION AND EXTENSION[1]

Most South Georgia College students who are in college-parallel programs take College Algebra (Math 101) at this institution. To take Math 101, the student must have had two years of high school algebra. If he has not had two years, the student must take Math 100 (Intermediate Algebra) prior to his taking Math 101. This is generally a quite satisfactory procedure, since very few students would be able to succeed (grade of C) in Math 101 without two years of algebra in high school. However, the Mathematics Department has found that many S. G. C. students who do have two years of high school algebra are still not at a level where they can succeed in Math 101.

Recent research efforts at South Georgia College (Gelso & Wilson, 1967) have been directed at determining variables which are related to grades in Math 101 for students who have had two years of high school algebra. Locating these relevant variables would enable the prediction of grades in this course and, as a result, would produce information on whether a student with two years of high school algebra actually should take Math 101 without first taking Math 100.

It has been found that scores on both the Mathematics portion of the Scholastic Aptitude Test (SAT-M) and the Mathematics subtest of the

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[1]Paul Lott, student research assistant in the Student Personnel Division, aided in the gathering and analysis of the data used in this study.

Sequential Test of Education Progress (STEP-M) correlate moderately with grades in Math 101 for freshman males and that a freshman male should have approximately a 445 SAT-M and rank at the 68%ile on the STEP-M to have a good chance of getting a C or better in Math 101. However, since the correlations between Math 101 grades and these two indices are not high (SAT-M=.48, STEP-M=.46), a great deal of faith cannot be placed in the resulting predictions. Furthermore, it has been found that there is not a significant (non-chance) relationship between females' grades in Math 101 and their scores in both the SAT-M and the STEP-M.

PURPOSE AND PROCEDURE

The present study is an attempt to determine if grades in Math 101 correlate with and, as a result, can be predicted from, two measures of students' high school performance in algebra. These measures are: (1) the average of grades in the first and second algebra courses (Algebra I & II) which students take in high school, and (2) students' grades in the second high school algebra course (Algebra II). Knowledge of the relationship between these variables, in addition to the already available evidence on the relationship between SAT-M and STEP-M scores and Math 101 grades, should help faculty counselors advise students with two years of high school algebra on their chances of passing Math 101 and whether they should, in fact, take Math 101 without first taking Math 100.

The subjects for this study were all of the students (N=157) who entered S. G. C. in the 1965 Fall Quarter and took Math 101 as their

first mathematics course during either the 1965-1966 Fall, Winter, or Spring Quarter. This sample consisted of 117 males and 40 females. All of the subjects had had two years of high school algebra.

The characteristics of the subjects in this sample have been described elsewhere (see Gelso & Wilson, 1967). It suffices to say that both their mathematics aptitude (SAT-M) and achievement (STEP-M) were significantly better than that of the S. G. C. student body as a whole.

RESULTS

The first step in this investigation was to compute Pearson product-moment correlations between students' grades in Math 101 and (1) their algebra I & II high school average and (2) their grade in Algebra II. Since past research has demonstrated that the correlation of various indices with mathematics grades is different for males and females, the calculations in this study were made separately for the male and female subjects. The correlations between Math 101 grades and the two indices of high school mathematics performance are presented on Table 1.

Table 1

Correlations Between Algebra I & II High School Average and Math 101 Grades and Between Algebra II High School Grade and Math 101 Grade for Males and Females Separately.

Algebra I & II		Algebra II	
Males	Females	Males	Females
.47*	.56*	.49*	.63*

*significant at the .01 level of confidence.

The figures on Table 1 indicate that there was a substantial relationship between both the Algebra I & II average and the Algebra II grade and grades in Math 101 for both males and females. It is interesting to note that the correlations between Algebra II grades and Math 101 grades is slightly higher than the correlations between Algebra I & II average and Math 101 grades for both males and females. Another point worth noting is that the correlations between both measures of high school algebra performance and Math 101 grades are higher for females than they are for males. This latter finding is especially interesting in light of the fact that in the aforementioned study by Gelso and Wilson, significant (non-chance) correlations were not found to exist between either SAT-M scores or STEP-M percentiles and Math 101 grades for females. The correlations of SAT-M and STEP-M with Math 101 grades for males, on the other hand, w s almost identical (.48 and .46 respectively) as those found in the present study.

Predicting Math 101 Grades from grades in Algebra II

The second step in this study was to predict the probable grades which students would earn in Math 101 on the basis of their high school Algebra II grades. These predictions were made through the use of a regression equation.[2] Since the correlations between Math 101 grades and Algebra II grades were higher than the correlations between Math 101

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[2]The equation which was used is: $\bar{Y} + \left(\frac{\Sigma xy}{\Sigma x^2}\right)(X - \bar{X})$

grades and Algebra I & II averages, Math 101 grades were not predicted from Algebra I & II averages.

Table 2 presents the estimated or predicted Math 101 grades of students with different grades in Algebra II (e.g. A, B+, B, C+, C, etc.). The left side of the table presents the predicted grades for males, while the right side presents the predictions for females.

Table 2

Predicted Math 101 Grades on the Basis of Algebra II High School Grades

Males			Females		
Algebra II Grade		Predicted Math 101 Grade	Algebra II Grade		Predicted Math 101 Grade
4.0(A)	-------	3.5(B+)	4.0(A)	-------	2.9(C+)
3.5(B+)	-------	3.1(B)	3.5(B+)	-------	2.6(C+)
3.0(B)	-------	2.8(C+)	3.0(B)	-------	2.2(C)
2.5(C+)	-------	2.4(C)	2.5(C+)	-------	1.9(D+)
2.0(C)	-------	2.0(C)	2.0(C)	-------	1.5(D+)
1.5(D+)	-------	1.6(D+)	1.5(D+)	-------	1.2(D)
1.0(D)	-------	1.2(D)	1.0(C)	-------	.8(F+)
.5(F+)	-------	.9(F+)	.5(F+)	-------	.5(F)
0(F)	-------	.5(F+)	0(F)	-------	.1(F)
Standard error of estimate=1.15			Standard error estimate=1.03		

Notice that females would have to earn higher grades than males in Algebra II in high school to have the same predicted grades as males in Math 101. For example, a male student who earns a 2.0 (C) in Algebra II has a predicted Math 101 grade of 2.0 (C). However, a female with the same grade in Algebra II would be predicted to make only a 1.5 (D+) in Math 101. For a female to have a predicted grade of 2.0 (C) in Math 101, she would had to have earned a 2.7 (C+) in Algebra II.

In using the predictions on Table 2 for advisement purposes, faculty counselors should keep in mind that the chances are .5 that the student will actually earn what he is predicted to earn or higher. In addition, the chances are about 68 out of 100 that the student's actual Math 101 grade will be within plus or minus one standard error of estimate of his predicted grade. Since the standard errors of estimate of the predicted grades (presented at the bottom of Table 2) for both the males and females are actually quite large, a great deal of confidence should not be placed on the specific predicted grades. Rather, these grades should be viewed as evidence which should be considered along with other relevant factors (e.g., SAT-M and STEP-M for males).

IMPLICATIONS AND CONCLUSIONS

According to the 1966-67 South Georgia College Bulletin, students who have had two years of high school algebra will not get credit for taking Math 100 at S. G. C. Due to this rule (which is not enforced) and other factors, faculty advisors generally suggest that their advisees take Math 101 if they have had two years of algebra in high school, regardless of students' performances in high school algebra. The evidence gathered in the present study suggests that this is not a sound procedure; for students' grades in their second high school algebra course are the best single predictors of how they will do in Math 101. The predicted grades indicate that if a freshman female earned a D (1.0) in Algebra II, her chances of earning a C (2.0) in Math 101 would be approximately 1 in 10. The chances of a freshman male

earning a C in Math 101 if he had made a D in Algebra II in high school would be about 1 in 4. This suggests that students' grades in their second high school algebra course should be carefully considered when advisors are discussing with them whether they should take Math 101 without first taking Math 100.

It is interesting that freshman females' grades in Math 101 correlate closely (r=.63) with their Algebra II high school grades, while in their previous study the investigators found no significant relationships between either freshman females SAT-M scores or STEP-M local percentiles and their Math 101 grades. It may be that standardized mathematics test scores generally have little value in predicting females' freshman-year grades. This has been found to be the case in some of the prediction research done on S. G. C. females by Hills, Klock & Bush, (1965). However, for freshman males, the SAT-M, STEP-M, Algebra I & II average, and Algebra II grade correlate about equally with Math 101 grades (r=.48, .46, .47, .49 respectively). Yet, none of these indices correlate as highly with Math 101 grades for males as does the Algebra II grade for females.

It should be kept in mind that, since the SAT-M, STEP-M, and Algebra II grade correlates about equally with Math 101 grades for freshman males, all of these variables should be considered in advisement work. It was found that the multiple correlation between these three indices and Math 101 grades was .65. Thus, if a male freshman with two years of high school algebra has a predicted Math 101 grade of about 1.0 (D) based on his SAT-M, STEP-M, and Algebra II grade, it is a

good bet that he will make a D in Math 101 if he does not first take Math 100. For the convenience of faculty advisors, the grade predictions for Math 101 based on SAT-M and STEP-M for male subjects are presented in the appendix (p. 11) of this report. Again, they should be used along with the predictions based on Algebra II grades (p. 5) when advising freshman males. For example, if a freshman male has a Math 101 PG of D based on his Algebra II grade, his chances of getting a C in Math 101 are still quite good if he has an SAT-M of 560 (PG=B-) and a STEP-M %ile of 95 (PG=C+). For freshman females, as previously mentioned, the only predictor which has been found to be of value is the Algebra II grade (p. 5).

Finally, the Mathematics Department has expressed an interest in modifying its grouping procedures so that not all students with two years of high school algebra would be permitted to take Math 101 without having first taken Math 100. Presently, this department is being forced to teach a partially college-level algebra course by enrolling students without sufficient high school backgrounds and aptitude. If the Mathematics Department wishes to base their new grouping procedures on statistical predictions, the two predictors of grades in Math 101 which would be most readily available prior to students' entrance are the SAT-M and the Algebra II grade (the STEP percentiles are available after registration). For freshman females, the grouping could be based on the Algebra II grade alone; while for freshman males, the grouping procedures could be based on the SAT-M and Algebra II grade. The multiple correlation between these two measures and Math 101 grades is .60 for freshman males, while individually they correlate with Math 101 grades only .48 and.49

respectively. Furthermore, it would appear feasible to use a C- or a D+ predicted grade as a cutoff point (students below this would take Math 100 first, although they had two years of high school algebra). Although students whose predicted Math 101 grades are D or D- have some chance of getting a C- in Math 101 as it is presently taught, the chances of their doing so would be appreciably reduced if this course is upgraded.

REFERENCES

Gelso, C. J. & Wilson, W. R. The Prediction of Grades in College Algebra. Research Report 67-1. South Georgia College. January, 1967.

Hills, J. R., Klock, J. A. & Bush, Marilyn L. The Prediction of Grades at South Georgia College and Analysis of the 1957 through 1962 Classes. Research Bulletin 1-65. Regents of the University System of Georgia, 1965.

Based on SAT-M and STEP-M for Male Subjects

SAT-M Score	Predicted Grade	STEP-M Percentile	Predicted Grade
670	4.03(A-)	99	2.67(C+)
640	3.76(B+)	90	2.47(C)
610	3.49(B)	70	2.02(C-)
560	3.04(B-)	58	1.76(D+)
530	2.76(C+)	47	1.50(D)
500	2.50(C)	27	1.01(D-)
445	2.00(C-)		
415	1.73(D+)		
395	1.55(D)		
335	1.01(D-)		
Standard Error of Estimate=1.18		Standard Error of Estimate=1.19	